LIQUID EFFLUENT GUIDELINES FOR THE PETROLEUM REFINING INDUSTRY

September, 1977

TD
899
.P4
.O57
1977

Ministry
of the
Environment

Ontario

The Honourable
George A. Kerr, Q.C.,
Minister

K.H. Sharpe,
Deputy Minister

TD
899.P4
O57
1977

LIQUID EFFLUENT GUIDELINES
FOR THE
PETROLEUM REFINING INDUSTRY

September, 1977

Copyright Provisions and Restrictions on Copying:

This Ontario Ministry of the Environment work is protected by Crown copyright (unless otherwise indicated), which is held by the Queen's Printer for Ontario. It may be reproduced for non-commercial purposes if credit is given and Crown copyright is acknowledged.

It may not be reproduced, in all or in part, part, for any commercial purpose except under a licence from the Queen's Printer for Ontario.

For information on reproducing Government of Ontario works, please contact Service Ontario Publications at copyright@ontario.ca

STATEMENT OF INTENT

The primary purpose of these guidelines is to assist Ministry staff in the execution of abatement and approvals functions. They may also be used by industry as an indication of environmental control requirements.

These guidelines are supplementary to the "Guidelines and Criteria for Water Quality Management in Ontario" and the "Objectives for the Control of Industrial Wastes Discharges in Ontario".

The guidelines reflect overall Ministry policy. They should be applied recognizing specific requirements of individual sites, alternate process and abatement technology, and the need to stage programs which will achieve the Ministry's goals in a rapid but realistic manner.

INTRODUCTION

The application of Provincial effluent objectives and National effluent regulations to the petroleum refining industry will be directed towards the maintenance of receiving water quality which will allow for all beneficial uses and protect fish and other aquatic life. In this context, reference should be made to the published Ontario Ministry of the Environment Guidelines and Criteria for Water Quality Management in Ontario. The water quality criteria proposed for natural waters in Ontario that are applicable to the protection of fish and aquatic life and for public surface water supplies are most significant in this case.

GENERAL RECEIVING WATER QUALITY CRITERIA

The purpose of these guidelines is to provide general criteria which are consistent with Provincial environmental management objectives.

The pertinent objectives for receiving water quality are as follows:

1. The presence of visible oil in the receiving water is to be minimized;

2. Contaminants that impart objectionable colour, taste and odour to potable water supplies are to be maintained at or below their threshold concentration values. Relative to phenol, the prescribed threshold concentration values range from an average of 2 ppb to a maximum of 5 ppb (Reference: Objectives for the Control of Industrial Waste Discharges in Ontario).

N.B.

When considering effluent discharges, a minimum dilution factor of 10:1 has been assumed to arrive at the effluent quality objective.

3. Receiving waters are to be protected such that the dissolved oxygen levels are maintained at not less than 5 mg/l in streams supporting warm water biota or 6 mg/l in cold water streams.

4. Receiving water quality should never be impaired to the point of demonstrated acute lethal, sub-lethal, or chronic adverse effects on important local species of aquatic life.

5. Nutrient additions that stimulate the undesirable growth of algae and other objectionable plant, fungal or bacterial organisms in receiving waters are to be minimized.

Without limiting the foregoing, the Ministry will, where necessary, assign mixing zones to individual effluents to ensure that the receiving water quality objectives are met. In general, the International Joint Commission objectives or subsequent Ministry objectives will be applied at the periphery of these mixing zones.

CONTROLS CONSISTENT WITH NATIONAL EFFLUENT REGULATIONS AND GUIDELINES

Reference should be made to "Petroleum Refinery Effluent Regulations and Guidelines" published by the Water Pollution Control Directorate of Environment Canada for the specific national regulations and guidelines. The aim of the regulations and guidelines is to ensure that all petroleum refineries in Canada apply best practicable technology to the treatment of their liquid effluent.

For the petroleum refining industry, best practicable technology means a system equivalent to the following:

1. two stages of oil removal (API separators and dissolved air flotation);
2. sour water stripping for sulfide and ammonia removal;
3. biological treatment of all process waters;
4. safe disposal of spent chemicals;
5. treatment of contaminated, or partly contaminated storm water for oil removal;

6. treatment of ballast waters for oil removal;
7. waste flow equalization;
8. good housekeeping and maintenance.

The numerical limits on controls which are contained in the National Guidelines and Regulations and which are expressed in pounds per thousand barrels of crude oil through-put have been derived from the following concentration parameters:

Oil and Grease	-	10 mg/l
Phenol	-	1 mg/l
Suspended Solids	-	25 mg/l
Ammonia	-	12.5 mg/l
pH	-	6.0 - 9.5

These reflect what is believed to be attainable by the designated best practicable technology. These have been expressed in terms of pounds per thousand barrels on the basis of an assumed process water usage rate of 20 CGPM (Canadian gallons per minute) per thousand barrels of crude oil through-put per day for a new refinery and 40 CGPM for existing refineries.

N.B. According to EPS Ontario Region, the Canadian Bureau of Standards defines a Canadian gallon as 4.546090 litres. An Imperial gallon is 4.546092 litres.

PROVINCIAL ADMINISTRATION OF NATIONAL REGULATIONS AND GUIDELINES

The National effluent regulations and guidelines are administered in Ontario by the Ontario Ministry of the

Environment in co-operation with the Ontario Regional Office of the Environmental Protection Service of Environment Canada.

The primary objective is the installation of the designated level of best practicable technology, or its equivalent, to meet both National and Provincial effluent controls. At the same time, the monitoring requirements of the National Regulations and Guidelines will be implemented by the Ontario Ministry of the Environment in order to assess compliance.

SITE SPECIFIC EFFLUENT QUALITY OBJECTIVES

The Ontario Ministry of the Environment will, where necessary, set more stringent effluent requirements than the National Regulations and Guidelines to deal with problems such as tastes and odours in public water supplies, tainting of fish flesh, sub-lethal effects on important local species of aquatic life and other environmental considerations not covered by The Canada Fisheries Act.

TABLE I

Ontario Effluent Quality Objective for Petroleum Refineries

Oil and Grease	- 10 mg/l maximum
Phenols	- 20 ug/l maximum
Suspended Solids	- 15 mg/l maximum
Ammonia Nitrogen	- 10 mg/l maximum
COD	- 200 mg/l maximum *
pH	- 5.5 - 9.5
Chromium	- 1 mg/l maximum
Copper	- 1 mg/l maximum
Nickel	- 1 mg/l maximum
Lead	- 1 mg/l maximum
Zinc	- 1 mg/l maximum

No froth, scum or objectionable odour or colour.

* This is an interim objective based on the capability of current best practicable treatment technology, it may be revised as alternative technology becomes available and where dictated by demonstrated adverse effects on receiving water quality.

The effluent quality objectives in Table I may be used as the basis upon which site-specific requirements are negotiated to satisfy local needs dictated by receiving stream water quality and usage.

Acute Toxicity (Reference: National Guidelines and Regulations)

100% LC50 - (96-hour flow-through test using rainbow trout fingerlings). This represents more than 50% survival of fish in the bioassay sample.

In refineries where a significant degree of water conservation is practised, resulting in low effluent discharges, preparation of the bioassay sample should be in accordance with Schedule IX of The Petroleum Refinery Effluent Regulations and Guidelines EPS 1-WP-74-1.

For routine purposes, report 24-hour static bioassay test results or their equivalent for the following streams:

(a) Process effluent
(b) Once-through cooling water
(c) Treated storm water

In general, these objectives will result in acceptable water quality but in the event that receiving water quality objectives are not met using the foregoing effluent quality guidelines, additional effluent controls may be necessary.

MONITORING AND REPORTING

Monitoring and reporting requirements which are consistent with Provincial administration of the National Regulations and Guidelines and local concerns will be negotiated on an individual basis. Normally, regular testing and reporting is only expected for certain control parameters which reflect good operation of treatment facilities and comply with the requirements of the National Guidelines and Regulations.

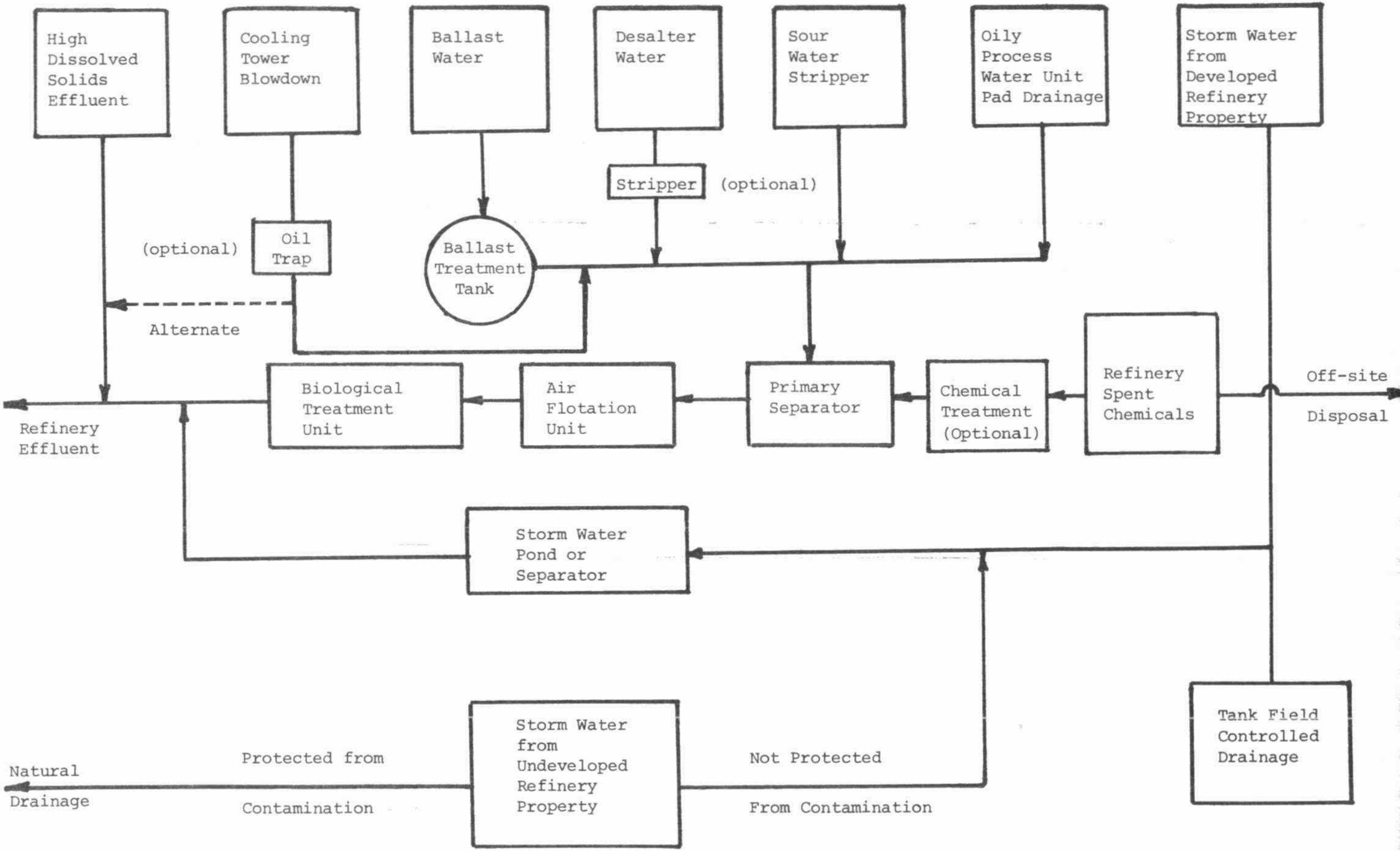
WASTE TREATMENT FACILITIES

Waste treatment facilities for new refineries, and any significant modifications to existing facilities, require Ministry approval before installation. The diagram on Page 9 represents schematically an example of an idealized effluent segregation and treatment system which is consistent with best practicable technology.

Safe disposal of spent chemicals means approved in-plant treatment or the transmittal of the chemicals to an approved off-site facility by a licenced contractor.

Applications for approval of treatment facilities will be evaluated on the basis of the provision of a comparable waste segregation system and appropriate design and engineering of waste collection and treatment facilities.

PETROLEUM REFINERY BEST PRACTICABLE TREATMENT


High Dissolved Solids Effluent
Cooling Tower Blowdown
Ballast Water
Desalter Water
Sour Water Stripper
Oily Process Water Unit Pad Drainage
Storm Water from Developed Refinery Property
Stripper
(optional)
(optional)
Oil Trap
Ballast Treatment Tank
Alternate
Refinery Effluent
Biological Treatment Unit
Air Flotation Unit
Primary Separator
Chemical Treatment (Optional)
Refinery Spent Chemicals
Off-site Disposal
Storm Water Pond or Separator
Natural Drainage
Protected from Contamination
Storm Water from Undeveloped Refinery Property
Not Protected From Contamination
Tank Field Controlled Drainage

TD
899
P4
.O57
1977